

CLAIMS

1. A fine particle producing apparatus comprising:

a metal holder (30) for housing a powdery or elongate
5 body of metal therein;

a tube (32) mounted on said metal holder (30) for
supplying a gas to said body of metal through a porous
member (28a);

a gas flow rate controller (34) for controlling a rate
10 at which said gas is supplied to said tube (32); and

a gas heating controller (36) connected to said tube
(32) for heating said gas supplied to said body of metal to
a predetermined temperature thereby to generate fine metal
particles from said body of metal.

2. A fine particle producing apparatus according to

claim 1, wherein said metal holder (30) is detachably
mounted on a casting mold (38) and held in communication
with a cavity (40) defined in said casting mold (38) for
20 supplying said fine metal particles into said cavity (40).

3. A fine particle producing apparatus according to
claim 2, wherein said metal holder (30) is substantially in
the form of a box, further comprising:

a cartridge (46) carrying said body of metal sealed
25 therein and replaceably housed in said metal holder (30).

4. A fine particle producing apparatus comprising:

a metal holder (30) for housing a powdery or elongate body (26) of magnesium therein;

a tube (32) mounted on said metal holder (30) for supplying an inactive gas to said body (26) of magnesium through a porous member (28a);

a gas flow rate controller (34) for controlling a rate at which said inactive gas is supplied to said tube (32);

a gas heating controller (36) connected to said tube (32) for heating said inactive gas supplied to said body (26) of magnesium to a predetermined temperature to produce at least a magnesium gas or fine particles of magnesium from said body (26) of magnesium; and

a reaction unit (144) for being supplied with a nitrogen gas heated to a predetermined temperature and causing a reaction between at least said magnesium gas or said fine particles of magnesium and said nitrogen gas to produce fine particles (150) of magnesium nitride, said metal holder (30) being mounted on said reaction unit (144).

5. A fine particle producing apparatus according to

claim 4, wherein said reaction unit (144) is detachably mounted on a mold (142) and held in communication with a cavity (152) defined in said mold (142) for supplying said fine particles (150) of magnesium nitride into said cavity (150).

6. A fine particle producing apparatus according to claim 4, further comprising:

a fine metal particle producing mechanism (22) mounted on said reaction unit (144) for producing at least said magnesium gas or said fine particles of magnesium; and

a high-temperature gas producing mechanism (24) mounted on said reaction unit (144) for producing said nitrogen gas heated to said predetermined temperature.

7. A fine particle producing apparatus according to claim 6, wherein said fine metal particle producing mechanism (22) and said high-temperature gas producing mechanism (24) have respective axes inclined to each other by a predetermined angle within an angular range up to 90°.

8. A casting apparatus comprising:

a mold (38) for supplying a molten metal into a cavity (40) to produce a casting; and

a fine particle producing apparatus (20) directly connected to said mold (38) for introducing fine metal particles immediately after the fine metal particles are produced, directly into said cavity (40);

said fine particle producing apparatus (20) comprising:

a metal holder (30) for housing a powdery or elongate body of metal therein;

a tube (32) mounted on said metal holder (30) for supplying a gas to said body of metal through a porous

member (28a);

a gas flow rate controller (34) for controlling a rate at which said gas is supplied to said tube (32); and

5 a gas heating controller (36) connected to said tube (32) for heating said gas supplied to said body of metal to a predetermined temperature thereby to generate fine metal particles from said body of metal.

10 9. A casting apparatus according to claim 8, further comprising:

a molten metal check mechanism (42) disposed between said mold (38) and said fine particle producing apparatus (20), for preventing said molten metal from flowing back into said fine particle producing apparatus (20).

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10. A casting apparatus comprising:

a mold (142) for supplying a molten metal into a cavity (152) to produce a casting; and

20 a fine particle producing apparatus (140) directly connected to said mold (142) for introducing fine metal particles immediately after the fine metal particles are produced, directly into said cavity (152);

said fine particle producing apparatus (140) comprising:

25 a metal holder (30) for housing a powdery or elongate body (26) of magnesium therein;

a tube (32) mounted on said metal holder (30) for

supplying an inactive gas to said body (26) of magnesium through a porous member (28a);

a gas flow rate controller (34) for controlling a rate at which said inactive gas is supplied to said tube (32);

a gas heating controller (36) connected to said tube (32) for heating said inactive gas supplied to said body (26) of magnesium to a predetermined temperature to produce at least a magnesium gas or fine particles of magnesium from said body (26) of magnesium; and

a reaction unit (144) for being supplied with a nitrogen gas heated to a predetermined temperature and causing a reaction between at least said magnesium gas or said fine particles of magnesium and said nitrogen gas to produce fine particles (150) of magnesium nitride, said metal holder (30) being mounted on said reaction unit (144).

11. A casting apparatus according to claim 10, further comprising:

a molten metal check mechanism (42) disposed between said mold (142) and said reaction unit (144), for preventing said molten metal from flowing back into said reaction unit (144).

12. A casting apparatus comprising:

a mold (38) for supplying a molten metal into a cavity (40) to produce a casting;

a fine particle producing mechanism (22) directly connected to said mold (38) for introducing fine metal particles immediately after the fine metal particles are produced, directly into said cavity (40); and

5 a reactive gas supply mechanism (24) directly connected to said mold (38) at a position different from said fine particle producing mechanism (22), for supplying said cavity (40) with a reactive gas for reacting with said fine metal particles to produce an active substance which is more
10 active with respect to oxygen than said molten metal.

13. A casting apparatus according to claim 12, wherein said molten metal comprises molten aluminum, said fine metal particles comprise fine particles of magnesium, said
15 reactive gas comprises a nitrogen gas, and said active substance comprises magnesium nitride.

14. A casting apparatus comprising:

a mold (142) for supplying a molten metal into a cavity
20 (152) to produce a casting;

a fine particle producing mechanism (22) for producing fine metal particles;

a reactive gas supply mechanism (24) for supplying a reactive gas for reacting with said fine metal particles to
25 produce an active substance which is more active with respect to oxygen than said molten metal; and

a reaction unit (144) directly connected to said mold

(142) for causing a reaction between said fine metal particles and said reactive gas to produce said active substance and immediately thereafter introducing said active substance directly into said cavity (152), said fine particle producing mechanism (22) and said reactive gas supply mechanism (24) being coupled to said reaction unit (144).

15. A casting apparatus according to claim 14, wherein said molten metal comprises molten aluminum, said fine metal particles comprise fine particles of magnesium, said reactive gas comprises a nitrogen gas, and said active substance comprises magnesium nitride.

16. A casting apparatus comprising:
a mold (38) for supplying a molten metal into a cavity (40) to produce a casting; and
an active substance producing mechanism (100) directly connected to said mold (38) for producing an active substance which is more active with respect to oxygen than said molten metal and immediately thereafter introducing said active substance directly into said cavity (40).

17. A casting apparatus according to claim 16, wherein said molten metal comprises molten aluminum, and said active substance comprises at least either one of magnesium nitride and fine particles of magnesium.

18. A method of pouring a molten metal into a cavity (40) in a mold (38) to produce a casting, comprising the steps of:

5 supplying a heated gas to a metal which is more active with respect to oxygen than said molten metal, thereby to produce a feed material (110) containing at least a metal gas or fine metal particles;

10 supplying said feed material (110) to said cavity (40) to cause said feed material (110) to be oxidized to develop a low-oxygen environment in said cavity (40), and causing at least said metal gas or said fine metal particles to float in said cavity (40) and be deposited on an inner wall surface of said cavity (40); and

15 pouring said molten metal into said cavity (40).